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Is it Enough?

Army Innovation in Its Use of Space going into the 21st Century

By John Marrs

One question that has arisen in considering the relevance of Space activities to the transformation of the Army is whether the Army is being innovative enough (some would say proactive enough) in using and driving the development of future Space capabilities. This is important since the development of information superiority, situational awareness, reduced forward footprints, enhanced precision attack, and force protection are in large part enabled by a robust Space capability supporting the transformed Force.

Innovation

What is innovation? Webster's defines innovation as "something newly introduced; new method, custom, device, etc.; change in the way of doing things." Space is a place. What we are really asking is how can we use this new place to better do battle with our enemies?

Do we need to use, promote, or create innovation in Space capabilities that support the transformation of the Force well into the 21st century? Let's begin by examining some of the profound developments in technology that impacted military operations in the past.

Black Powder

Black powder (a compound of sulfur, charcoal, and potassium nitrate) was developed in China sometime before the 8th century. Writings reference its use to throw arrows and stones. Several hundred years were required for it to become known and used in the Western World. Roger Bacon, an internationally known scientist, wrote a treatise on its preparation in 1242. Its first documented use was in the form of "bombs" at the battle of Al-Mansura in 1250. Innovation in quality, production and "spin-off" products continued well into the 19th century. Innovations in other materials allowed the development of cannon and ultimately the artillery we know today. Major innovation spanned centuries.

Tanks

The first rudimentary "tanks" were inspired by putting armor on ordinary trucks. Technologists quickly reasoned that the same could be done with a vehicle that could go "cross country" and also carry a cannon as well as machine guns. As is frequently the case, the technologist's "viewgraphs" outstripped the ability of engineers to actually build the device. Military leaders were reluctant to use the new weapon, but the terrible loss of life on the Western Front provided a compelling warfighter need. Tanks were the hope to break the trench warfare stalemate. They were first used on Sept. 15, 1916, at the Battle of the Somme and subsequently with some success. Between the world wars, Germany became the home of the principal innovators in the development of tanks and the doctrine/tactics by which they would be used in World War II. Generals Eisenhower and Patton kept the idea of the tank alive in the United States, but we entered World War II as technical, doctrinal, and tactical inferiors to the Germans. By the end of World War II, the tank had reached the level of premier weapon system in the U.S. Army. Technical improvements since that time, while profound, have been incremental in nature. Major innovations spanned half a century.

Aircraft Carriers

The innovative marriage of aircraft and a ship occurred with the commissioning of the Langley (CV-1) on March 20, 1922. The first flight was launched from her decks on Oct. 17, 1922. Doctrine and tactics for the use of aircraft carriers developed slowly between the world wars. Development was slow due to lack of funding and little confidence by the senior leadership of the Navy that the carrier would have much of a role in a battle that was expected to be between lines of battleships. Development proceeded despite this and, unlike tanks, the United States maintained technical parity with

Army's creative use of Space integral to obejctive force

The Army does not view Space activities as a core competency and this has been solidified at the national level by designating the Air Force as the executive agent for Space. Thus, the Army (from the point of view of a Space advocate) has limited resources and authority to influence the development of Space capabilities. The Army's role, however, has been (and is likely to continue to be) one of pushing for user equipment that exploits Space. There is ample opportunity for the Army to be creative and innovative in development of capabilities integral to the Objective Force.

The Army has a vested interest in helping to control the high ground, which means that air defense concepts already expanded to missile defense must be expanded to control of Space.

Japan, our principal naval opponent. Two other technical advances — jet engine aircraft and nuclear power systems — have driven innovations since World War II. Major innovations spanned half a century.

Space

The United States launched a satellite into Space in 1958 and the Army led the way. The Army did much of the developmental work on missiles as well as communication, navigation, and imaging satellites that were the foundation for the nation's Space programs. By the early 1960s, the Army's work in satellites (done principally by what is now the Army Communications-Electronics Command) migrated to NASA, the U.S. Air Force or the National Reconnaissance Office. The Army and national leadership did not view "Space" as a core competence of the Army. While this was arguably a mistake, Army leadership did recognize that the medium of Space provided the "high ground." Possession of the high ground has always enhanced and supported the Army's ability to accomplish its missions. With respect to launch operations, fundamental innovations spanned only a couple of decades although recent activity by both NASA and the Air Force gives hope for future advances. Meanwhile, fundamental innovations in satellites continue into the foreseeable future.

Tactical Exploitation of National Capabilities

The Tactical Exploitation of National Capabilities (TENCAP) program seeks to integrate current and emerging national capabilities into the tactical decision-making process. In 1973, the Army took the lead in the Department of Defense by establishing the Army Space Program Office (ASPO) to execute the Army TENCAP program, serve as the unique technical and fiscal interface with the national program offices and manage the TENCAP materiel acquisition. ASPO has an outstanding record in rapidly exploiting national capabilities and integrating these capabilities into the Army's (and sometime other services') tactical decision-making process. This approach was so successful that Congress ordered all services to establish a TENCAP program based on the Army's model in 1977. Innovations continue to roll out the door at ASPO. Individual innovations occur on timelines of less than a decade.

Grenadier Beyond Line-Of-Sight Range and Tracking System (BRAT)

One of ASPO's most recent innovations, Grenadier BRAT combines a small user device containing a global positioning system with a transmitter. It produces a signal captured by a satellite system, which is processed through various nodes, including the U.S. Army Space and Missile Defense Command's (SMDC's) Space-Based Blue Force Tracking Mission Management Center (MMC). The information then passes on to numerous military users. The whole process is fast enough to give very good situational awareness of the location of friendly units. Grenadier BRAT came about quietly. National capabilities to receive certain low probability of intercept/detect signals (highly classified at the time) were made known to ASPO and the U.S. Army Space and Strategic Defense Command (now SMDC) leadership in the early 1990s. By 1993, the first "lab" models were being developed to prove the technical feasibility. By 1994, the Army Training and Doctrine Command's (TRADOC's)

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Battle Command Battle Lab (BCBL) joined the effort and obtained general TRADOC consensus on the need by February 1997. At the end of the 1990s, lingering technical issues were resolved by ASPO. With the assistance of the BCBL and the Space and Missile Defense Battle Laboratory (SMDBL), a warfighter's rapid acquisition program was initiated to obtain the first operational units (although limited prototypes were already in use). It became apparent that operational use of Grenadier BRAT would require a Mission to smoothly connect the national technical capability with users in the field. The U.S. Space Command assigned that mission to SMDC (Army Space Command) in March 2001. Subsequent to Sept. 11, 2001, the planned future operational capability of the Mission Management Center was accelerated and around-the-clock operations began in January 2002. ASPO has continued to field additional devices and provide new training equipment worldwide. Through evaluations from Operations Enduring Freedom and Iraqi Freedom, the role of Grenadier BRAT and related devices will be shown to be vital to the overall effort. Innovation spanned less than a decade.

Space Innovation in the Near Term out to 2030

Innovation in Space is progressing at a quickening tempo with respect to satellites. This is partly because the same advances in materiel, electronic, and computing technologies that are driving changes in the rest of modern society are driving the Space business. The one disappointing area is the ability to launch "things" into Space. That remains a costly, risky business with no transformational improvements on the horizon. The Army is a leader in pushing requirements for future satellite innovations including Space-based radar, Space-based infrared system, transformal communications and improved position/navigation capabilities. These systems will greatly benefit the warfighter and the transformation of the force.

Army's Role

The Army has a vested interest in helping to control the high ground, which means that air defense concepts already expanded to missile defense must be expanded to control of Space. As the examples we see from TENCAP and from the SMDBL's Army Space Exploitation Demonstration Program (a white world version of TENCAP) prove, the Army can and does benefit from what the Air Force and others build in the way of Space systems.

Beyond 2030

Ray Kurzweil (a well known futurist) says that the rate of technology acceleration is itself accelerating. For instance, what took 100 years to develop between 1800-1900, we could now accomplish in 50 years at today's rate of progress, but, because the rate of progress is doubling every decade, we will see 100 years of progress, at today's rate, in only 25 calendar years. This could have dramatic effects on Space innovation. The pessimistic view of the launch problem (cost, risk) may be gone by 2030. With that constraint removed, Space will be populated by everything from coffins to grandmother's "motor home" to military systems. If this happens, the high ground will be accessible to the Army and Army systems will operate as freely there as they do on the ground today. The distinction between the Air Force and the Army could be blurred and, who knows, we could even see an entirely different type of combined service force.

Summary

The Army has chosen a role that focuses its resources on exploiting Space capabilities. It gets a relative bargain in the process since others bear the research and capital costs in developing the Space segment of these capabilities. Despite what we Space advocates might desire, it is a smart role for the Army and one that is not likely to change.

John Marrs for many years served as the Technical Director of Army Space Command. Under the new SMDC organization, he is part of the Office of the Chief Scientist. His wide-ranging duties and functions have included the Army Space Exploitation Demonstration Program, design of the ARSST and 1st Space Bn., Chair of the SMDC Spectral Imaging IPT, and participation in many studies done by OSD, NSSA, JFCOM, and the Army Science Board. Over his career he has worked for TRADOC, AMC, and FORSCOM (National Training Center Science Advisor).